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EXTOXNET

Extension Toxicology Network

Pesticide Information Profiles

A Pesticide Information Project of Cooperative Extension Offices of Cornell University, Oregon State University, the University of Idaho, and the University of California at Davis and the Institute for Environmental Toxicology, Michigan State University. Major support and funding was provided by the USDA/Extension Service/National Agricultural Pesticide Impact Assessment Program.

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Bendiocarb

Trade and Other Names: Trade names include Ficam, Dycarb, Garvox, Multamat, Multimet, Niomil, Rotate, Seedox, Tattoo, and Turcam.

Regulatory Status: Most formulations of bendiocarb are classified as General Use Pesticides (GUP), with the exception of Turcam and Turcam 2.5 G, which are classified as Restricted Use Pesticides (RUP). Restricted use pesticides may be purchased and used only by certified applicators. Bendiocarb is toxicity class II - moderately toxic. Products containing bendiocarb bear the Signal Word WARNING.

Chemical Class: carbamate

Introduction: Bendiocarb is a carbamate insecticide. It is effective against a wide range of nuisance and disease vector insects. It is used to control mosquitoes, flies, wasps, ants, fleas, cockroaches, silverfish, ticks, and other pests in homes, industrial plants, and food storage sites. In agriculture. it is used against a variety of insects, especially those in the soil. Bendiocarb is also used as a seed treatment on sugar beets and maize and against snails and slugs. Pesticides containing bendiocarb are formulated as dusts, granules, ultra-low volume sprays, and as wettable powders.

Formulation: Pesticides containing bendiocarb are formulated as dusts, granules, ultra-low volume sprays, and as wettable powders.

Toxicological Effects:

- **Acute toxicity:** Bendiocarb is moderately toxic if it is ingested or if it is absorbed through the skin [5]. Absorption through the skin is the most likely route of exposure. It is a mild irritant to the skin and eyes [5]. Like other carbamate insecticides, bendiocarb is a reversible inhibitor of cholinesterase, an essential nervous system enzyme. Symptoms of bendiocarb poisoning include weakness, blurred vision, headache, nausea, abdominal cramps, chest discomfort, constriction of pupils, sweating, muscle tremors, and decreased pulse. If there is severe poisoning, symptoms of twitching, giddiness, confusion, muscle incoordination, slurred speech, low blood pressure, heart irregularities, and loss of reflexes may also be experienced. Death can result from discontinued breathing, paralysis of muscles of the respiratory system, intense constriction of the openings of the lung, or all three [5]. In one case of exposure while applying bendiocarb, the victim experienced symptoms of severe headache, vomiting and excessive salivation, and his cholinesterase level was depressed by 63%. He recovered from these symptoms in less than 3

hours with no medical treatment and his cholinesterase level returned to normal within 24 hours. In another case, poisoning occurred when an applicator who was not wearing protective equipment attempted to clean contaminated equipment. The victim experienced nausea, vomiting, incoordination, pain in his arms, hands and legs, muscle spasms, and breathing difficulty. These symptoms abated within 2 hours after decontamination and treatment with atropine. The victim fully recovered by the following day (5). The oral LD50 for bendiocarb is 34 to 156 mg/kg in rats, 35 to 40 mg/kg in rabbits, and 35 mg/kg in guinea pigs. The dermal LD50 is 566 mg/kg in rats (5). The acute inhalation LC50 (4-hour) is 0.55 mg/L air in rats (10).

- **Chronic toxicity:** A two-year study with rats fed high doses of 10 mg/kg/day showed a wide range of changes in organ weights, blood, and urine characteristics, as well as an increased incidence of stomach and eye lesions [5].
- **Reproductive effects:** In a three-generation study with rats, fertility and reproduction were not affected by bendiocarb at dietary doses of up to 12.5 mg/kg/day. Very high prenatal and postnatal doses of 40 mg/kg/day were toxic to rat dams and reduced pup weight and survival rates. No effects were seen at 20 mg/kg/day [5]. Thus, no reproductive effects are likely in humans at expected exposure levels.
- **Teratogenic effects:** No teratogenic effects were seen in the offspring of rats given 4 mg/kg/day or in rabbits given 5 mg/kg/day of bendiocarb during gestation [5].
- **Mutagenic effects:** Numerous studies show that bendiocarb is not mutagenic [5].
- **Carcinogenic effects:** Bendiocarb was not carcinogenic in 2-year studies of rats and mice [5].
- **Organ toxicity:** No changes in organ weight or harmful effects in tissues were observed in a 2-year dietary study of dogs fed doses of up to 12.5 mg/kg/day despite elevated serum cholesterol and decreased levels of calcium in the bloodstream [5].
- **Fate in humans and animals:** Bendiocarb is absorbed through all the normal routes of exposure, but dermal absorption is especially rapid. Carbamates generally are excreted rapidly and do not accumulate in mammalian tissue. If exposure does not continue, cholinesterase inhibition and its symptoms reverse rapidly. In nonfatal cases, the illness generally lasts less than 24 hours [21]. Within two days after feeding doses of up to 10 mg/kg of bendiocarb to rats, 89 to 90% of the dose was eliminated in the urine, 2 to 6% was exhaled, and another 2 to 6% was eliminated in the feces. This same pattern of elimination was observed in a human subject given an oral dose of bendiocarb [5].

Ecological Effects:

- **Effects on birds:** Bendiocarb is moderately toxic to birds. The LD50 in mallard ducks is 3.1 mg/kg, and in quail is 19 mg/kg [22].
- **Effects on aquatic organisms:** Bendiocarb is moderately to highly toxic to fish. The LC50 (96-hour) for bendiocarb in rainbow trout is 1.55 mg/L [10].
- **Effects on other organisms:** Earthworm populations under turf are severely affected by bendiocarb [21]. It is toxic to bees. The LD50 is 0.0001 mg per bee.

Environmental Fate:

- **Breakdown in soil and groundwater:** The half-life of bendiocarb varies with soil type from less than 1 week to up to 4 weeks [10,23]. It has a low soil persistence.
- **Breakdown in water:** Bendiocarb is degraded in solution by the chemical action of water (hydrolysis). It does not accumulate in water.
- **Breakdown in vegetation:** Bendiocarb is not toxic to plants when used as directed [10].

Physical Properties:

- **Appearance:** Bendiocarb is an odorless, white crystalline solid. It is stable under normal temperatures and pressures, but should not be mixed with alkaline preparations. Thermal decomposition products may include toxic oxides of nitrogen. It is noncorrosive.
- **Chemical Name:** 2,3-isopropylidenedioxyphenyl methylcarbamate [10]
- **CAS Number:** 22781-23-3
- **Molecular Weight:** 223.23

- **Water Solubility:** 40 mg/L @ 20 C [10]
- **Solubility in Other Solvents:** acetone v.s.; benzene s.; chloroform s.; dioxane v.s.; ethanol s.; hexane v.s. [10]
- **Melting Point:** 129-130 C [10]
- **Vapor Pressure:** 0.66 mPa @ 25 C [10]
- **Partition Coefficient:** 1.6990 [10]
- **Adsorption Coefficient:** 570 [13]

Exposure Guidelines:

- **ADI:** 0.004 mg/kg/day [10]
- **MCL:** Not Available
- **RfD:** 0.0013 mg/kg/day [20]
- **PEL:** Not Available
- **HA:** Not Available
- **TLV:** Not Available

Basic Manufacturer:

Roussel Uclaf Corp.
95 Chestnut Ridge Road
Martvale, NJ 07645

- **Phone:** 201-307-9700
- **Emergency:** Not Available

References:

References for the information in this PIP can be found in Reference List Number 3
